

REMARKS

Initially, the undersigned notes the claims that the Examiner considers to be in the above-identified application. That is, in the Office Action Summary for the Office Action mailed September 10, 2003, the Examiner indicates that claims 9, 19-21, 23 and 25-27 are in the application. In addition, in the detailed portion of this Office Action mailed September 10, 2003, the Examiner addresses claims 21-30 and 33. The Examiner does not specifically address claims 31 and 32, which were added in the Amendment After Final Rejection filed May 5, 2003; entry of this Amendment After Final Rejection filed May 5, 2003 was requested in the Request for Continued Examination (RCE) Transmittal filed June 3, 2003. In addition, the Examiner has considered claims 22, 24 and 28 on pages 2 and 3 of the Office Action mailed September 10, 2003, notwithstanding that these claims 22, 24 and 28 were cancelled without prejudice or disclaimer in the Amendment After Final Rejection filed May 5, 2003. It is unclear from the Office Action mailed September 10, 2003, as to the specific claims that the Examiner considers to be presently in the above-identified application, and which of the various amendments has been considered by the Examiner in the Office Action mailed September 10, 2003. Specifically, it is unclear as to whether the Examiner considered claims as amended in the Amendment After Final Rejection filed May 5, 2003. In any event, to clarify the record, it is respectfully submitted that the following claims are presently in the application: that is, claims 19-21, 23, 25-27 and 29-33 are presently pending in the application, with these claims as presently amended being provided herein as a listing.

Applicants have amended their specification and claims in light of comments by the Examiner in the Office Action mailed September 10, 2003, and to further clarify the description of the present invention. Specifically, Applicants have amended their specification and claims to recite a bottom residue of the distillation, rather than a still residue. Noting comments by the Examiner in Item a on page 3 of the Office Action mailed September 10, 2003, it is respectfully submitted that this amendment to the specification and claims does not add new matter to the application.

In addition, Applicants have amended claim 29 to recite that high-boiling components having a higher boiling point than that of ditrimethylolpropane are removed, by distillation, from the "product of said acid decomposition". Furthermore, claim 33 has been amended to recite that the molecular distillation is performed using a film molecular still, and that the remainder of the bottom residue, after removing high-boiling components using the film molecular still, is condensed product from the top of the film molecular still. Noting, for example, the description of molecular distillation in McGraw-Hill Encyclopedia of Science & Technology, Vol. 7 (7<sup>th</sup> Ed. 1992), pages 342-3, submitted with the Supplementing Submission (Amendment) filed June 3, 2003, and in particular the molecular still in Fig. 2; and also noting comments by the Examiner in Item b bridging pages 3 and 4 of the Office Action mailed September 10, 2003, it is respectfully submitted that this amendment of the claim 33 does not constitute new matter.

The rejection of claims 21 and 22 under the first paragraph of 35 USC §112, as failing to comply with the written description requirement, is respectfully traversed. It is noted that in the reasons given by the Examiner for this rejection under the first

paragraph of 35 USC §112, the Examiner refers to claims 21 and 25, and not any other claim. In any event, the Examiner's attention is respectfully directed to processes (5) and (6) on page 3 of Applicants' specification, in connection with the process defined in claim 21. Note also details in connection with (1) removing the high-boiling component, (2) the acid decomposition and (3) the crystallization, respectively at page 8, lines 9-13; page 5, lines 15-26, for example; and page 8, lines 14-16, of Applicants' specification. See also Example 4 on page 17 of Applicants' specification. Contrary to the conclusion by the Examiner, clearly the subject matter of claim 21 is described in Applicants' original disclosure, as required under the first paragraph of 35 USC §112.

With respect to the subject matter of claim 25, note process (7) on pages 3 and 4 of Applicants' specification; and note also Example 5 bridging pages 17 and 18 of Applicants' specification. Contrary to the conclusion by the Examiner, it is respectfully submitted that the subject matter of claim 25 is also fully described in Applicants' specification, as required under the first paragraph of 35 USC §112.

With regard to the rejection under the first paragraph of 35 USC §112, while the Examiner has referred to claim 25 she has not specifically rejected claim 25 under the first paragraph of 35 USC §112. Accordingly, it is respectfully submitted that claim 25 is not rejected under the first paragraph of 35 USC §112. In any event, as shown previously, the subject matter of claim 25 is clearly supported in the original disclosure.

Reference by the Examiner to "the claimed 80°C", in Item b under the rejection under the first paragraph of 35 USC §112, set forth on page 2 of the Office Action mailed September 10, 2003, is noted. Basis for this rejection is not understood. In the Amendment After Final Rejection filed May 5, 2003, claim 19 has been amended to

recite a temperature range of 20- "180°C", rather than 20-80°. Accordingly, the Examiner is respectfully requested to point out the specific claim having "the claimed 80°C" recitation.

Rejection of claims under the second paragraph of 35 USC §112, set forth on page 2 of the Office Action mailed September 10, 2003, is respectfully traversed, especially insofar as applicable to the claims presently in the application. Thus, the Examiner contends that claim 22 is already recited in claim 21, and is thus claimed twice. However, claim 22 has previously been cancelled without prejudice or disclaimer, in the Amendment After Final Rejection filed May 5, 2003. Accordingly, there is not seen to be any relevance to the statement by the Examiner that the subject matter of claim 22 was already recited in claim 21, since claim 22 has been cancelled without prejudice or disclaimer.

In light of amendments to claim 33, it is respectfully submitted that the basis for rejection of claim 21 under the second paragraph of 35 USC §112, as set forth in Item b under the 35 USC §112, second paragraph, rejection, is moot. That is, claim 33 has been amended to recite a film molecular still; clearly, such film molecular still can be used for molecular distillation, as seen in the pertinent pages of the McGraw-Hill Encyclopedia of Science & Technology, referred to previously. That is, the film molecular still would have an evaporator and condenser, plus qualifying to perform distillation. In view of amendments to claim 33, clearly the molecular distillation as in claim 21 is proper.

Objection by the Examiner to claims 24 and 28, the Examiner contending that these claims would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims, is noted. As clarified previously, claims 24 and 28 have previously been cancelled without prejudice or disclaimer, and claims 31 and 32 added to the application. Compare recitations in claims 24 and 28, with recitations in presently pending claims 31 and 32. In view of comments by the Examiner in connection with claims 24 and 28, it is respectfully submitted that claims 31 and 32 should be allowed. Note that while claims 31 and 32 were in the above-identified application, from the Amendment After Final Rejection filed May 5, 2003, prior to the Office Action mailed September 10, 2003, the Examiner failed to consider claims 31 and 32; such failure is clearly erroneous.

The indication by the Examiner that claims 19, 20, 29 and 30 would be allowable if rewritten or amended to overcome the rejections under the second paragraph of 35 USC §112, set forth in the Office Action mailed September 10, 2003, is noted. As can be appreciated from a full review of the Office Action mailed September 10, 2003, only claims 21 and 22 were rejected under the second paragraph of 35 USC § 112, and claims 19, 20, 29 and 30 were not rejected under the second paragraph of 35 USC §112. Accordingly, it is respectfully submitted that claims 19, 20, 29 and 30 should be allowed, particularly in light of amendments to these claims to recite "bottom" residue rather than a still residue.

As for the remaining claims, that is, claims 21, 23, 25-27 and 33, it is respectfully submitted that the subject matter set forth in these claims would have neither been disclosed nor would have been suggested by the teachings of Great Britain Patent Specification No. 1,292,405 (GB '405), under the provisions of 35 USC §103.

It is respectfully submitted that this reference as applied by the Examiner would

have neither taught nor would have suggested such process as in the present claims, including, inter alia, wherein high-boiling components having a higher boiling point than that of the ditrimethylolpropane are removed by molecular distillation from a bottom residue of the distillation for separating trimethylolpropane; and, after removing the high-boiling components, a formal compound contained in the remainder of the bottom residue is subjected to acid decomposition, and resulting products of this acid decomposition are subjected to crystallization using a solvent. See claim 21.

In addition, it is respectfully submitted that this applied reference would have neither disclosed nor would have suggested such a recovery process of ditrimethylolpropane as recited in the present claims, this recovery process including subjecting a bottom residue of the distillation for separating trimethylolpropane to crystallization using a solvent, leaving a remainder of the bottom residue; subjecting a formal compound in this remainder to acid decomposition; and recovering ditrimethylolpropane by subjecting the resulting products of the acid decomposition to crystallization. See claim 25.

Furthermore, it is respectfully submitted that the teachings of the applied reference would have neither disclosed nor would have suggested the other aspects of the present invention as in remaining claims, rejected over GB '405, having features as in claims 21 and/or 25, and further including (but not limited to) wherein the acid decomposition of the formal compounds is performed at a temperature of 20-180°C using at least one of a mineral acid and an organic acid (see claims 23 and 26), particularly wherein the acid decomposition of the formal compounds is performed by using an organic acid (see claim 27); and/or wherein the molecular distillation is

performed using a film molecular still, with the remainder of the bottom residue, after removing high-boiling components using the film molecular still, being condensed product from the top of the film molecular still (see claim 33).

As can be appreciated, according to various aspects of the present invention, including as set forth in claim 21, high-boiling components having a higher boiling point than that of ditrimethylolpropane are removed, e.g., by distillation, before the acid decomposition. Due thereto, it becomes easy to remove color components. Where removal of the high-boiling components having a higher boiling point than that of ditrimethylolpropane is omitted before the acid decomposition, as in the applied reference, color components remain after the acid decomposition and it is difficult to remove these color components.

In addition, by removing the high-boiling component having a higher boiling point than that of ditrimethylolpropane before acid decomposition, as in claim 21, use of a strong acid is unnecessary. That is, an organic acid such p-toluenesulfonic acid can be used for the acid decomposition, because high-boiling components having a higher boiling point than that of ditrimethylolpropane has been removed before the acid decomposition. Use of the organic acid has advantages in that there is greater freedom of selection of materials for plant components, and corrosion is reduced.

Further with respect to claim 21, by removing the high-boiling components having a higher boiling point than that of ditrimethylolpropane by molecular distillation, as in claim 21, and, in particular, using a film molecular still (see claim 33), amount of necessary drainage is decreased because steam need not be added at the time of removal of the high-boiling component. For example, the applied reference uses steam

in a vacuum steam distillation; e.g., in Example 4 of the applied reference, about 2.5 times the amount of steam, as compared to the bottom residue, was removed, showing the disadvantageously great amount of drainage required in the applied reference, as compared to the aspect of the present invention using molecular distillation.

In connection with the subject matter of claim 25, by removing the high-boiling components having a higher boiling point than that of ditrimethylolpropane by crystallization, using a solvent, before the acid decomposition, removal of the high-boiling components having a higher boiling point than that of ditrimethylolpropane is more complete, as compared with, for example, removal by distillation.

GB '405 discloses a method of purifying ditrimethylolpropane, particularly that formed as a by-product in the production of trimethylolpropane by reacting n-butyraldehyde with formaldehyde in an aqueous medium in the presence of an alkaline catalyst. This patent document discloses that when crude ditrimethylolpropane material (containing various formals) is heated together with methanol in the presence of an acid catalyst, there occurs an acetal exchange reaction between the added alcohol and the formals so that the formals of ditrimethylolpropane are converted into ditrimethylolpropane, as a result of which ditrimethylolpropane can be isolated and purified easily. See page 1, lines 9-15. Note also the paragraph bridging pages 2 and 3. See also page 3, lines 20-26. This patent document further discloses that after the reaction, the acidic catalyst is neutralized with a suitable alkaline substance such as sodium hydroxide, potassium hydroxide or calcium hydroxide, and then the remaining alcohol is distilled away. See page 2, lines 43-47. This patent document also discloses the use of vacuum distillation with superheated steam either prior to or after



the reaction in the presence of the acid catalyst. See the paragraph bridging the left-hand and right-hand columns on page 2.

With respect to that aspect of the present invention set forth in claim 21, note that the high-boiling component having a higher boiling point than that of ditrimethylolpropane are removed prior to the acid decomposition, according to the present invention. In contrast, note Example 1 of the applied reference, disclosing addition of methanol and concentrated sulfuric acid directly to the crude ditrimethylolpropane. It is respectfully submitted that this reference would not have disclosed, nor would have suggested, removal of high-boiling components prior to the acid decomposition, or the unexpectedly better results achieved through removal of high-boiling components prior to the acid decomposition, including removal of coloring components which disadvantageously affect the final product, these coloring components being difficult to remove after acid decomposition. That is, as seen from Applicants' specification, by first removing high-boiling components, coloring components, which are disadvantageous, can be avoided. Note, for example, page 11, lines 5-7 of Applicants' specification.

Furthermore, note that GB '405 uses vacuum steam distillation in, e.g., examples thereof. Note, for example, Example 4 of the applied reference. This vacuum steam distillation requires relatively large amounts of steam, resulting in a large amount of drainage necessary in the method of the applied reference. In comparison, and as discussed previously, the amount of drainage according to aspects of the present invention can be small, due to use of molecular distillation, especially when using a film molecular still. Particularly in view of this additional advantage, it is

respectfully submitted that the applied reference would have neither taught nor would have suggested aspects of the present invention as in claim 21.

Moreover, it is respectfully submitted that the applied reference is silent with respect to removal of high-boiling components by crystallization using a solvent, as in claim 25. It is respectfully submitted that the applied reference would have neither taught nor would have suggested this aspect of the present invention, and advantages thereof, wherein removal of the high-boiling components can be more completely achieved.

Contentions by the Examiner with respect to the sequence of steps in claim 21, set forth in the last full paragraph on page 3, and the paragraph bridging pages 3 and 4, of the Office Action mailed February 3, 2003, are noted. However, it is respectfully submitted that the applied reference provides no differentiation in results, with respect to when in the sequence the high-boiled components are removed from the still residue. In view of the unexpectedly better results achieved according to the present invention, in removing coloring components which disadvantageously affect the final product, these coloring components being difficult to remove after acid decomposition, it is respectfully submitted that Applicants' have further established unobviousness of this aspect of the present invention.

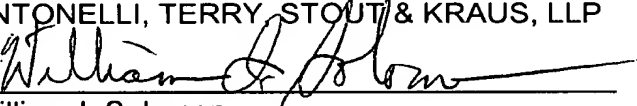
**Applicants maintain the request for an interview, prior to a further Office Action in the above-identified application. The undersigned will be contacting the Examiner to schedule such interview.**

In view of the foregoing comments and amendments, reconsideration and allowance of all claims remaining in the application are respectfully requested.

To the extent necessary, Applicants petition for an extension of time under 37 CFR § 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 396.40405X00), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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